Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

280.39
P31A
op. 2

ARS 51-9
August 1966

MALATHION-TREATED DRYING TRAYS TO PROTECT RAISINS FROM INSECTS--COMMERCIAL TESTS IN 1965

U. S. DEPT. OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY
[illegible]
CURRENT SERIAL RECORDS

Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

CONTENTS

Page

Acknowledgments 2
Summary 3
Background of the study. 3
Procedure. 4
    Treatment of trays 4
    Malathion residue on trays. 4
    Malathion residue on raisins 4
Results. 5
    Malathion residue on trays. 5
    Malathion residue on raisins 6

ACKNOWLEDGMENTS

The California Raisin Advisory Board made funds available for this study during the 1965 season to cover partial costs of residue analysis, field assistance, purchase of raisins, and trays. Charles D. Fisher, Research Director of the Board, assisted in planning the study and obtaining grower cooperators.

Curtis Lynn, University of California, Fresno County Farm and Home Advisor for grapes and berries, assisted in distributing the trays and supervised procurement of the raisin samples.

E. J. Orloski, Group Leader, American Cyanamid Company, Agricultural Division, Princeton, N.J., analyzed samples of malathion-treated paper trays.

Professor V. E. Petrucci and Nick Dokoozlian, Viticulture Department, Fresno State College, made equipment of the college available for processing the raisins and supervised the actual processing.

The cooperating vineyardists, selected by the California Raisin Advisory Board, were Harper Gabrielson, Frank Lanse, Dick Markarian, and Ed Steffen of Fresno County, Tom Jadwin of Tulare County, and B. J. Peterson of Madera County.

MALATHION-TREATED DRYING TRAYS TO PROTECT RAISINS, FROM INSECTS--COMMERCIAL TESTS IN 1965

Howard D. Nelson
Market Quality Research Division,[1] Agricultural Research Service
U.S. Department of Agriculture

SUMMARY

In earlier USDA studies, when grapes were dried into raisins on malathion-treated paper trays, they picked up enough malathion from the trays to protect them from insects during the drying period. Residue of 2 parts per million (p.p.m.) or more protected the raisins during at least one year of storage.

The official tolerance for the use of malathion-treated raisin-drying trays specified that the trays shall not contain more than 200 milligrams (mg.) of malathion per square foot of tray and that raisins dried on the trays shall not contain more than 8 p.p.m. of malathion after processing.

In the earlier studies the malathion residues were sometimes higher than was expected. The purpose of this study was to get information on the variation that could be expected in residues on raisins exposed on these trays.

Raisins were dried on trays coated with 100 mg. and 200 mg. of malathion emulsion per square foot in six vineyards in three California counties. Immediately after manufacture and treatment, the trays contained more than the 100 and 200 mg. of malathion per square foot. When they were placed in the vineyards, the malathion deposit was nearer to the intended amount. Residues varied between trays at a given level of treatment.

Residue on natural raisins dried on trays containing about 100 mg. of malathion per square foot ranged from 3.2 to 9.5 p.p.m. On trays containing about 200 mg. per square foot, residues on the raisins varied from 3.7 to 25.8 p.p.m. For some unknown reason, residue on raisins dried in one vineyard was higher than the residue in the other vineyards with either level of tray treatment. Processing the raisins reduced the residue by one-third to one-half.

This study shows that raisins dried on trays containing about 100 mg. of malathion per square foot will have a malathion residue that is less than the legal tolerance of 8 p.p.m. for processed raisins, and the residue will be sufficient to protect the raisins from insects during drying and storage.

BACKGROUND OF THE STUDY

Studies begun in 1961 by the Dried Fruit and Tree Nut Insects Investigations, United States Department of Agriculture, have shown that a malathion coating on paper raisin-drying trays can control insects that are attracted to the grapes drying on the trays. Raisins dried on these trays picked up amounts of malathion that varied according to the deposit on the tray. Raisins that contained more than 2 p.p.m. were protected from insects for at least one year in storage after they had been taken from the trays.[2]

---

[1] This study was made at the Dried Fruit and Tree Nut Insects Investigations, Fresno, Calif. This is one of the field units of the Stored-Product Insects Research Branch, Market Quality Research Division.

As a result of these studies, an official tolerance was established by the Food and Drug Administration in February 1965 for residues of malathion on raisins dried on malathion-treated trays. The tolerance specified that the trays used must not contain more than 200 mg. of malathion per square foot and that processed ready-to-eat raisins that had been dried on these trays should not contain more than 8 p.p.m. of malathion.

Studies in 1964 showed that residue of more than 8 p.p.m. is occasionally present on natural unprocessed raisins that have been dried on trays that contain nearly 200 mg. per square foot.[3] The purpose of the 1965 study was to obtain additional information on the variation of malathion residues that can be expected on raisins dried on treated trays.

Four vineyards in Fresno County, one in Tulare County, and one in Madera County were selected as sites for a study of malathion residue during the 1965 raisin-drying season.

PROCEDURE

Treatment of trays.--The paper trays were treated during the manufacturing process with an emulsion that was a dilution from a premium-grade 57-percent malathion emulsifiable concentrate. One group of trays was treated at a calculated rate of 100 mg. of malathion per square foot of tray surface, and the other group at 200 mg. These treated trays, packaged in bundles of about 1,000 trays each, were shipped by the manufacturer to the Farm and Home Advisor's Office in Fresno. One bundle of trays at each deposit level was distributed to each of the cooperating vineyardists. The trays were placed in the vineyards between September 4 and 11, 1965. Grapes were removed from the vines and placed on the trays by the regular picking crews.

Malathion residue on trays.--Samples of the treated trays taken from five different 1,000-tray bundles were analyzed for malathion residue at the paper manufacturer's laboratory just after they were treated. Other samples taken from four different trays were analyzed by the Coast Laboratories and by the Chemical Unit of the Stored-Product Insects Research and Development Laboratory at the time the trays were placed in the vineyards. The latter two laboratories used the same method of analysis, and comparative samples were analyzed by all three laboratories before the study began.

As a further check on the uniformity of malathion residue from one tray to another, three trays at 100 mg. per square foot and three at 200 mg. per square foot were sampled. Each tray was cut into 1/2-inch squares, and the squares from each tray were thoroughly mixed. Four 7.5-gram samples from each tray were sealed in separate tin cans. One can of samples from each tray was sent to each of the above laboratories and also to American Cyanamid Company's laboratory for malathion residue determinations.

Malathion residue on raisins.--The grapes were dried into raisins and the raisins were removed from the trays between September 29 and October 16, 1965. As the raisins were removed from the trays, a 25- to 50-lb. sample of raisins was taken at random from trays treated with 100 mg. of malathion per square foot and a similar sample from trays treated with 200 mg. from each vineyard. Each sample was thoroughly mixed. Three 1-quart cans were filled from each sample and sealed. After sealing, two of the cans from each sample were sent to the Stored-Product Insects Research and Development Laboratory and one to a commercial laboratory for malathion determinations.

In two of the vineyards, raisins from each of the two treatment levels were set aside to be processed. They were processed on December 7 and 9, 1965, at a pilot-scale processing plant at Fresno State College. This processing plant had all of the important features of the commercial units used by the raisin industry. Before and after processing, three 1-quart samples were taken from a larger mixed sample from each tray treatment; two of the three samples were forwarded to the Stored-Product Insects Research and Development Laboratory and the third to the commercial laboratory.

---

[2] Nelson, Howard D., Spitler, Garth H., and Yerington, Albert P. Protecting Raisins Against Insects During Drying and Storage with Malathion-Treated Trays. U.S. Dept. Agr., Mktg. Res. Rpt. 594, 18 pp., illus. April 1963.

[3] Yerington, Albert P., and Hartsell, Preston. Unpublished data.

At the laboratories, these samples were analyzed to determine the effect of processing on the malathion residue in the raisins.

Moisture readings on the unprocessed and processed raisins were also made.

RESULTS

Malathion residue on trays.--The average amount of malathion on the trays at the time of treatment is presented in table 1. In each instance the average amount of malathion on the trays was greater than the intended deposit. There was considerable variation in the amount of malathion found on different trays in the same sample or bundle.

Chemical analyses of the residues at the time the trays were delivered to the vineyards are also shown in table 1. The residues obtained by the two laboratories were similar when compared on a sample or bundle basis. The residues were lower than those at the time the papers were treated. The amount of residue varied between trays in the same bundle.

Table 1.--Malathion on raisin-drying trays treated at levels intended to deposit 100 and 200 mg. per square foot

Vineyard and intended malathion deposit	At time trays were treated		When trays were placed in field	
	Average[1]	Range	Average[2]	Range
	Mg./sq. ft.	Mg./sq. ft.	Mg./sq. ft.	Mg./sq. ft.
Gabrielson:				
100 mg./sq. ft.	108.3	90.5 - 131.6	102.5	88.0 - 121.0
200 mg./sq. ft.	227.8	211.0 - 249.5	200.5	188.0 - 226.0
Markarian:				
100 mg./sq. ft.	119.4	83.1 - 155.3	100.5	88.0 - 119.0
200 mg./sq. ft.	214.2	171.8 - 238.8	157.2	106.0 - 210.0
Steffen:				
100 mg./sq. ft.	126.2	85.0 - 151.8	115.8	96.0 - 128.0
200 mg./sq. ft.	241.6	221.2 - 260.7	204.5	194.0 - 214.0
Lanse:				
100 mg./sq. ft.	123.4	94.6 - 144.7	124.5	117.0 - 138.0
200 mg./sq. ft.	207.6	197.6 - 215.9	168.5	162.0 - 182.0
Peterson:				
100 mg./sq. ft.	109.7	83.4 - 135.7	105.2	82.0 - 125.0
200 mg./sq. ft.	221.3	187.9 - 248.6	206.8	198.0 - 215.0
Jadwin:				
100 mg./sq. ft.	128.9	98.3 - 160.2	121.8	96.0 - 146.0
200 mg./sq. ft.	228.8	220.9 - 239.9	203.5	188.0 - 219.0

[1] Average of 5 to 13 trays.

[2] Average of 4 trays.

Residues varied between samples taken from the same tray, as well as between trays. Some of this variation was undoubtedly due to difference in methods used at the laboratories.

Malathion residue on raisins.--Raisins dried on the malathion-treated trays picked up varying amounts of malathion. Results of the analyses of the residue on the raisins are presented in table 2. The residues measured by the two laboratories agree closely. The residue on the raisins taken from the Jadwin Ranch was abnormally high, a condition that cannot be explained. The residue on the unprocessed raisins dried at the other locations ranged from 3.2 to 6.5 p.p.m. for those from trays with the lower malathion deposit and from 3.7 to 8.3 p.p.m. for those with the higher deposit. According to results of previous studies, these residues should protect the raisins from insects.

Table 2.--Malathion on trays when they were placed in vineyards, and malathion picked up by raisins during drying

Vineyard and average malathion on trays at beginning of period	Malathion[1] on natural raisins as determined by--	
	USDA Laboratory [2]	Commercial laboratory[3]
	P.p.m.	P.p.m.
Gabrielson:		
102.5 mg./sq. ft.	4.2	3.2
200.5 mg./sq. ft.	8.3	8.1
Markarian:		
100.5 mg./sq. ft.	3.2	3.3
157.2 mg./sq. ft.	6.7	8.0
Steffen:		
115.8 mg./sq. ft.	4.4	4.9
204.5 mg./sq. ft.	7.8	8.0
Lanse:		
124.5 mg./sq. ft.	4.8	4.9
168.5 mg./sq. ft.	4.0	3.7
Peterson:		
105.2 mg./sq. ft.	4.0	6.5
206.8 mg./sq. ft.	5.8	8.0
Jadwin:		
121.8 mg./sq. ft.	9.5	6.8
203.5 mg./sq. ft.	25.8	24.0

[1] Samples of raisins that were dried on untreated trays in each vineyard were analyzed, and malathion residues less than the sensitivity of the method (0.5 p.p.m.) were obtained.

[2] Stored-Product Insects Research and Development Laboratory. Each number is average of two samples.

[3] Each number is based on one sample.

The malathion residue found on the processed raisins is shown in table 3. Processing removed from one-third to one-half of the malathion. These results are similar to those obtained in previous studies.[4] Except on the natural raisins dried on trays treated with 200 mg. of malathion per square foot in the Gabrielson vineyard, all residues were below the established legal tolerance.

---

[4] See footnote 2.

Table 3.--Malathion on unprocessed and processed raisins dried on malathion-treated trays

Vineyard and malathion residue on trays	USDA Laboratory[1]						Commercial laboratory	
	Natural raisins			Processed raisins			Natural raisins	Processed raisins
	Sample 1	Sample 2	Average	Sample 1	Sample 2	Average		
	P.p.m.	P.p.m.	P.p.m.	P.p.m.	P.p.m.	P.p.m.	P.p.m.	P.p.m.
Gabrielson:								
102.5 mg./sq. ft. . .	3.6	6.6	5.1	2.3	2.2	2.2	3.8	2.5
200.5 mg./sq. ft. . .	8.7	8.3	8.5	6.6	6.5	6.6	8.0	6.0
Peterson:								
105.2 mg./sq. ft. . .	5.3	4.9	5.1	3.1	3.0	3.0	3.9	3.4
206.8 mg./sq. ft. . .	7.3	6.9	7.1	4.8	4.7	4.8	6.3	4.3

[1] Stored-Product Insects Research and Development Laboratory.

Moisture readings of samples of raisins before and after processing are presented in table The natural raisins from the Gabrielson vineyard contained less moisture than those from th Peterson vineyard. Processing increased the moisture content of the raisins from both vineyard

Table 4.--Moisture content of unprocessed and processed raisins dried on malathion-treated trays

Vineyard and malathion residue on trays	Natural raisins	Processed raisins
	Percent	Percent
Gabrielson:		
102.5 mg./sq. ft.	11.4	15.8
200.5 mg./sq. ft.	13.0	16.0
Peterson:		
105.25 mg./sq. ft. . . .	20.0	21.7
206.75 mg./sq. ft. . . .	15.0	13.5

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Hyattsville, Md. 20782

Official Business

Postage and Fees Paid
U. S. Department of Agriculture

PROTECT
Use Pesticides Safely
FOLLOW THE LABEL
U.S. DEPARTMENT OF AGRICULTURE

USE PESTICIDES SAFELY

If you use pesticides, apply them only when needed and handle them with care. Follow the directions and heed all precautions on the container label. If pesticides are handled or applied improperly, or if unused portions are disposed of improperly, they may be injurious to humans, domestic animals, desirable plants, honey bees, and other pollinating insects, fish, and wildlife and may contaminate water supplies.